What is the role of clinical audits in highly reliable hospitals?
Dr. Yew Fong Lee

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Medical Quality Unit,
Penang State Health Department,
Ministry of Health, Malaysia.

Advocate for Gender, Patient Safety,
Occupational Health,
Infection Prevention and Control.
01 Role of clinical audit in performance surveillance
02 Examples of successful clinical audits
03 Sustainable clinical audit initiatives
High Reliability Hospital

- Specific Considerations
  - Sensitivity to Operations
  - Preoccupation with Failure
  - Deference to Expertise
  - Resilience
  - Reluctance to Simplify

- General Orientation

- Impact on Processes

- Ultimate Outcome
  - Exceptionally Safe, Consistently High Quality Care

State of Mindfulness → High Reliability
What is Clinical Audit?
Definition from the National Institute of Clinical Excellence (NICE) 2012:

- A quality improvement process that seeks to improve patient care against explicit criteria & the implementation of change.

- Aspect of the structure, process & outcomes of care are selected & systematically evaluated against explicit criteria.

- Where indicated, changes are implemented at individual, team, or service level & further monitoring is used to confirm improvement in healthcare delivery.
Definition – less formal

- Taking note of what we do
- Learning from it
- Changing it if necessary
- With the aim of improving care
What Should Be Happening

What Is Happening?

What changes are needed
One small step in the journey

One major step towards improving quality
7 pillars of Clinical Governance

- Clinical Audit, CPG, Evidence-based medicine
Clinical Audit Cycle

1. Plan For Audit
2. Standard and Criteria Selection
3. Measuring Performance
4. Making Improvements
5. Sustaining Improvements
Structure ie facilities being provided
Eg waiting times, availability of staff, record keeping (all patient records should have a summary card), equipment

Process ie what was done to the patient eg referrals, prescribing, investigations, Aspirin post MI, BP measurements 5 yearly in those aged 20-65

Outcome ie result for the patient
Eg patient satisfaction

high risk practices (significant event audits) eg pneumococcal vaccines in splenectomised patients, are significant events being acted upon?
Criteria

= yardsticks

“An audit criterion is a specific statement of what should be happening.”
A) defines a measurable item of health care
B) can be used to assess quality

KEYPOINT
Criteria should be explicit. You must demonstrate evidence for justifying them (literature search, Evidence Based!).
“An audit standard is a minimum level of acceptable performance for that criterion.”

- Should include a suitable timeframe
<table>
<thead>
<tr>
<th></th>
<th><strong>Identify SIQ</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Patient factors</strong></td>
</tr>
<tr>
<td>2</td>
<td><strong>Task &amp; Technology factors</strong></td>
</tr>
<tr>
<td>3</td>
<td><strong>Staff factors</strong></td>
</tr>
<tr>
<td>4</td>
<td><strong>Team factors</strong></td>
</tr>
<tr>
<td>5</td>
<td><strong>Work &amp; care environment factors</strong></td>
</tr>
<tr>
<td>6</td>
<td><strong>Management &amp; organization factors</strong></td>
</tr>
<tr>
<td>7</td>
<td><strong>External factors</strong></td>
</tr>
</tbody>
</table>
What Audit Is Not

- Performance Appraisal of Staff
- Disciplinary Actions
- Needs Assessment
- Computers and Statistics
- Competition between doctors
- “Never judge good and bad professionals based on audit” – it is about improving care
Typical hospital organization chart

- **Hospital Director**
  - Chief Executive Officer
  - Name

- **Assistant Attorney General**
  - Hospital Attorney
  - Name

- **Human Resources**
  - Safety/Communications
  - Name

- **Patient Advocacy Services**
  - Chief Executive Officer
  - Name

- **Special Assistant**
  - Forensic Services
  - Name

- **Chief of Support Services**
  - Chief Financial Officer (CFO)
  - Name

- **Clinical Services Director**
  - Chief Medical Officer (CMO)
  - Name

- **Deputy Hospital Director**
  - Chief Operating Officer (COD)
  - Name

- **Director of Nursing**
  - Chief Nurse Executive (CNE)
  - Name
But healthcare really looks like this …
Healthcare Quality Milestones

1985: QAP launch – WHO
1985/1986: Development of indicators for patients (NIA)
1997: Strategic Plan

2006: NIA partly transformed to KPI
2008: KPI Tier 1
2011: KPI (Clinical) Revision – Accountability
Performance Index
2011: Report Card v.1
2012: NIA/ KPI Repopulate

2012 (Nov): ‘Selangor Declaration’ - reBRANDING
2013: NIA/ KPI – IHI Dimension Revision - Framework 1
HPIA Development – Q + Modified Balanced Scorecard
Clinical KPI – Tier 2 & below development
2013 (July): Performance Audit – Data Validity
2013: Report Card v.2 + Workload Index

2014: NIA Revised – Proxy (4 Disciplines)
Clinical KPI 1st - Tier 1: Performance Index
- WHO Framework
2015: Clinical KPI (2nd revision)
National Healthcare Quality Indicators Project
2015: Report Card v.3 + Workload Index + Other Relevant Parameters
Tier 2: Replicate/Cascade

*Move from purely QI to QI + accountability*
Suggested new KPI by MoH

“Percentage of medical officers with completed paper Study/research/ Case report) for postgraduate study application”

Definition of completed paper:
Any study/ research during their postgraduate training done by Medical Officer whom applying for Master Programmes.
Health Expenditure, Public
( % of Government Expenditure)

Source: The World Bank - 2013
Distribution of public hospitals in Penang

- Hospital Pulau Pinang (State Hospital)
- Hospital Balik Pulau (Non Specialist Hospital)
- Hospital Seberang Jaya (Major Specialist Hospital)
- Hospital Bt. Mertajam (Minor Specialist Hospital)
- Hospital Sg. Bakap (Non Specialist Hospital)

Distance between the clustered hospital: ≤ 25KM
## Number of specialist/subspecialist services

<table>
<thead>
<tr>
<th>HOSPITAL</th>
<th>Gen Medicine</th>
<th>Gen Surgery</th>
<th>Paediatric</th>
<th>Orthopaedic</th>
<th>Anaesthesiology</th>
<th>Ophthalmology</th>
<th>Otorhinology</th>
<th>Pathology</th>
<th>Radiology</th>
<th>Radiotherapy &amp; Oncology</th>
<th>Rehabilitation Med</th>
<th>Psychiatry</th>
<th>Emer Med.</th>
<th>Forensic Medicine</th>
<th>Paediatric Dental</th>
<th>Dental</th>
<th>No. of Speciality</th>
<th>No. of Subspeciality</th>
<th>Total</th>
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<tbody>
<tr>
<td>Pulau Pinang</td>
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<td>17</td>
<td>57</td>
<td>74</td>
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<tr>
<td>Seberang Jaya</td>
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<td>12</td>
<td>6</td>
<td>18</td>
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<tr>
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<td>✓</td>
<td>8</td>
<td>-</td>
<td>8</td>
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<tr>
<td>Kepala Batas</td>
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<td></td>
<td>✓</td>
<td>✓</td>
<td>7</td>
<td>-</td>
<td>7</td>
</tr>
</tbody>
</table>
• Total registered private hospital beds (2015) : 2207

• Total registered public hospital beds (2015) : 1969

• Total registered hospital beds in Penang (2015) : 4176

• Total population in Penang (2015) : 1,663 Million

• Population density : 1,600/km²
• Total Hospital beds to Population Ratio (2015), Penang

1: 398 (2.5 beds per 1000 population)

Hospital beds (per 1000 people) in Asia*

• Lower Middle Income - Vietnam (2010) : 2.0
• Lower Middle Income Country - India (2011) : 0.7
• High Middle Income Country - Malaysia (2012) : 1.9
• High Income Country - Singapore (2011) : 2.0

* The World Bank (http://data.worldbank.org/indicator/SH.MED.BEDS.ZS)
Examples of successful clinical audits

01 Clinical Audit on pre-operative blood ordering and transfusion policy in elective otorhinolaryngology surgeries

02 An Audit on universal newborn hearing screening (UNHS): Completing well-baby hearing screening by 1 month of age

03 To reduce the incidence of extravasation in contrasted CT scan examinations at diagnostic imaging department
Clinical Audit on pre-operative blood ordering and transfusion policy in elective otorhinolaryngology / Ear Nose & Throat (ENT) surgeries
Indications for blood transfusion in clinical practice

• In post-operative surgical patients and medical patients\(^2\)
  – Cross-matching done response to a demonstrated anaemia
  – Often transfused
• Pre-operative cross matching\(^2\)
  – Performed in anticipation
  – Seldom transfused

2. T. Palmer et al. Reducing unnecessary cross matching: A patient-specific blood ordering system is more accurate in predicting who will receive a blood transfusion than the maximum blood ordering system. Anaes Anaig 2003;96:369-75.
Justification for audit
Maximum Surgical Blood Ordering Schedule (MSBOS)

- MSBOS served as a guide in requesting and cross-matching blood preoperatively, however there is no standard guidelines for otorhinolaryngology/ENT surgeries

  - Limits the number of units held out of circulation
  - Widely accepted
  - Reduce unnecessary cross-matching
## Maximum Surgical Blood Ordering Schedule

### GENERAL SURGERY

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Quantity</th>
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<tbody>
<tr>
<td>Abdominal-perineal resection</td>
<td>4</td>
</tr>
<tr>
<td>Cholecystectomy</td>
<td>GSH</td>
</tr>
<tr>
<td>Gastrectomy</td>
<td>2</td>
</tr>
<tr>
<td>Hemicolecotomy, Small bowel resection</td>
<td>GSH</td>
</tr>
<tr>
<td>Hiatus hemia repair</td>
<td></td>
</tr>
<tr>
<td>- abdominal</td>
<td>GSH</td>
</tr>
<tr>
<td>- transthoracic</td>
<td>2</td>
</tr>
<tr>
<td>Inguinal hernia repair</td>
<td>GSH</td>
</tr>
<tr>
<td>Laparotomy</td>
<td>GSH</td>
</tr>
<tr>
<td>- Perforated viscus</td>
<td>2</td>
</tr>
<tr>
<td>Mastectomy</td>
<td>4</td>
</tr>
<tr>
<td>Oesophagectomy</td>
<td>4</td>
</tr>
<tr>
<td>Pancreatectomy</td>
<td>4</td>
</tr>
<tr>
<td>Portocaval shunt</td>
<td>4</td>
</tr>
<tr>
<td>Splenectomy</td>
<td>2</td>
</tr>
<tr>
<td>Thyroidectomy</td>
<td></td>
</tr>
<tr>
<td>Parathyroidectomy</td>
<td>GSH</td>
</tr>
<tr>
<td>Varicose veins</td>
<td>GSH</td>
</tr>
<tr>
<td>Vagotomy</td>
<td>GSH</td>
</tr>
<tr>
<td>Whipple’s procedure</td>
<td>4</td>
</tr>
</tbody>
</table>

### UROLOGY

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cystectomy</td>
<td>4</td>
</tr>
<tr>
<td>Nephrectomy</td>
<td>GSH</td>
</tr>
<tr>
<td>Percutaneous nephrolithotomy</td>
<td>GSH</td>
</tr>
<tr>
<td>Pyelolithotomy</td>
<td>GSH</td>
</tr>
<tr>
<td>- simple</td>
<td>GSH</td>
</tr>
<tr>
<td>- complicated or large calculus</td>
<td>2</td>
</tr>
<tr>
<td>Renal transplant</td>
<td>GSH</td>
</tr>
<tr>
<td>Retropubic prostatectomy</td>
<td>2</td>
</tr>
<tr>
<td>TUR prostate</td>
<td>GSH</td>
</tr>
<tr>
<td>Ureterolithotomy</td>
<td>GSH</td>
</tr>
</tbody>
</table>

### ORTHOPAEDIC

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Femoral osteotomy</td>
<td>2</td>
</tr>
<tr>
<td>Fractured humerus</td>
<td>GSH</td>
</tr>
<tr>
<td>Fractures neck of femur</td>
<td>GSH</td>
</tr>
<tr>
<td>Laminectomy, spinal fusion</td>
<td>2</td>
</tr>
<tr>
<td>Harrington rods</td>
<td>4</td>
</tr>
<tr>
<td>Putti-Platt shoulder repair</td>
<td>GSH</td>
</tr>
<tr>
<td>Total hip replacement</td>
<td>3</td>
</tr>
<tr>
<td>Total knee replacement</td>
<td>2</td>
</tr>
<tr>
<td>Total shoulder replacement</td>
<td>GSH</td>
</tr>
</tbody>
</table>

### GYNAECOLOGY

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hysterectomy</td>
<td></td>
</tr>
<tr>
<td>- abdominal, vaginal</td>
<td>GSH</td>
</tr>
<tr>
<td>- Wertheim</td>
<td>2</td>
</tr>
<tr>
<td>Myomectomy</td>
<td>2</td>
</tr>
<tr>
<td>Ovarian Cystectomy</td>
<td>GSH</td>
</tr>
<tr>
<td>Termination, D &amp; C</td>
<td>GSH</td>
</tr>
<tr>
<td>Vaginal Repair</td>
<td>GSH</td>
</tr>
<tr>
<td>Vulvectomy</td>
<td>2</td>
</tr>
</tbody>
</table>

### MISCELLANEOUS

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac catheterisation</td>
<td>GSH</td>
</tr>
<tr>
<td>Coronary angiogram</td>
<td>GSH</td>
</tr>
<tr>
<td>Liver, renal biopsy</td>
<td>GSH</td>
</tr>
<tr>
<td>Pacemaker insertion</td>
<td>GSH</td>
</tr>
</tbody>
</table>
Blood Utilization for Elective Surgeries at Main University Hospital in Alexandria, Egypt

Samaa Z. Ibrahim, Heba M. Mamdouh, Amal M. Ramadan

High Institute of Public Health, Alexandria, Egypt.

Abstract: This study aimed to determine the efficiency of blood ordering and transfusion practices for patients undergoing elective surgical procedures and to assess the compliance with the international blood transfusion clinical practice guidelines. Auditing of blood bank registers for patients who underwent elective surgical procedures was done at the Main University hospital in Alexandria governorate. The total number of adult patients who had elective surgery for which requests for cross matching were made was 4844; of them only 1788 patients were transfused. A total of 13389 units of blood were cross-matched, but only 3373 units were transfused. Only 25.2% of total blood cross matched was utilized, leaving 74.8% unutilized. The overall C/T ratio was 3.9, the overall %T was 36.9% and the overall TI was 0.69. The overall percentage compliance with Scottish Intercollegiate Guidelines was 27.7%. Institution-specific blood ordering schedules and protocols should be formulated to reduce exposure to transfusion and to screen for high-risk patient. Ongoing audit and monitoring of blood ordering and transfusion practices in the hospital are essential for improving the ordering, distribution, handling and administration of blood components.


Key words: blood ordering practices, transfusion practices, utilization indices
D. Data Collection Methods:

Data were collected using review of registers technique. Blood ordering and transfusion practices for elective surgical procedures in the surgical departments pertaining to the study hospital were assessed according to certain indices including: Cross match to Transfusion ratio, Transfusion Probability, and Transfusion Index [12-13]. These indicators were computed using the following equations:

1- Cross match to Transfusion ratio (C/T ratio) = 
   \[ \frac{\text{No. of units cross matched}}{\text{No. of units transfused}} \]

2- Transfusion Probability (%T) = 
   \[ \frac{\text{No. of patients transfused}}{\text{No. of patients cross matched}} \]

3- Transfusion Index (TI) = 
   \[ \frac{\text{No. of units transfused}}{\text{No. of patients cross matched}} \]

The probability of transfusion for a given department is denoted by %T and was suggested by Mead et al. (1980) [13]. A value of 30% and above has been suggested to be appropriate and signifies the appropriateness of numbers of units cross-matched [12]. According to what is recommended in the literature, the probability of transfusion values reported in the current study for the different surgical departments under the study are considered appropriate except for Urology (28.3%), Urology-endoscopy (15.7%) and Vascular-surgery department (20.3%). The results of the present study revealed an overall %T of 36.9%. This finding was higher than that has been found in study conducted in Indian tertiary care hospital where %T ranged from 11.1% to 25% [17].

Regarding TI, a value of 0.5 or more is indicative of efficient blood usage and signifies the appropriateness of numbers of units transfused [12]. The TI reported in the current study as an overall value (0.69) and the values of the different surgical departments under the study are considered...
“noticed that surgeons were making unnecessary arrangement of red cells. This was reflected in their undesirably high cross-matched to transfusion (CT) ratios.”

“We recommend that regular audits should be conducted in every institution to improve the quality of services, encourage team work and ensure high standards.”
Aim

• To avoid unnecessary wastage of blood products in elective otorhinolaryngology surgeries
Objective

• To determine the actual usage of blood products for elective otorhinolaryngology surgeries
Design

Wastage of blood cross-matched preoperatively in elective surgeries

POST-AUDIT
12th August – 31st August 2014

REMEDIATION MEASURES
1st August – 12th August 2014

PRE-AUDIT
1st May 2014-31st July 2014
Criteria and standards
Inclusion criteria

- All in-patient elective ENT surgeries from 1st of May to 31st August 2014
Exclusion criteria

• Elective daycare non-admission otorhinolaryngology (ENT) cases

• Surgeries under local anesthesia

• Combined surgeries
1. \( C = \frac{\text{No. of units cross matched}}{\text{No. of units transfused}} \) (standard: <3)

2. Transfusion probability (%) = \( \frac{\text{No. of patients transfused}}{\text{No. of patients cross matched}} \) \( \times \) 100% (standard: >30%)

3. Transfusion index (TI) = \( \frac{\text{No. of units transfused}}{\text{No. of patients cross matched}} \) (standard: >0.5)

100% Adherence
Results (Pre-Audit)
Table 1: Elective operations that were cross matched and transfused (1st May- 31st July 2014)

<table>
<thead>
<tr>
<th>Procedure</th>
<th>No. of Procedures</th>
<th>C</th>
<th>T</th>
<th>No. of patients cross-matched</th>
<th>No. of patients transfused</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total laryngectomy and thyroidectomy, glossectomy, unilateral RND, unilateral FND, flap reconstruction,</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total laryngectomy &amp; thyroidectomy</td>
<td>5</td>
<td>16</td>
<td>2</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Superficial parotidectomy</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Endoscopic maxillectomy</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Tracheal stenting</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>9</td>
<td>30</td>
<td>5</td>
<td>9</td>
<td>2</td>
</tr>
</tbody>
</table>

Overall index

1) Overall \(\frac{C}{T} = \frac{30}{5} = \frac{6}{1}\) (standard: <3)

2) Overall \(T\% = \frac{2}{9} \times 100 = 22.22\%\) (standard: >30%)

3) Overall \(TI = \frac{5}{9} = 0.56\) (standard: >0.5)

\(C = \) Number of units cross-matched
\(T = \) Number of units transfused

\(N=77\)
**Table 2: Elective operations (cross-matched and transfused) with index ratios (1\textsuperscript{st} May-31\textsuperscript{st} July 2014)**

<table>
<thead>
<tr>
<th>Procedure</th>
<th>C/T ratio</th>
<th>T%</th>
<th>TI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>D</td>
<td>I</td>
</tr>
<tr>
<td>Unilateral RND, Unilateral FND, Flap reconstruction, Glossectomy, Total laryngectomy and thyroidectomy</td>
<td>4</td>
<td>3</td>
<td>1.3</td>
</tr>
<tr>
<td>Total laryngectomy &amp; thyroidectomy</td>
<td>16</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Superficial parotidectomy</td>
<td>2</td>
<td>0</td>
<td>∞</td>
</tr>
<tr>
<td>Endoscopic maxillectomy</td>
<td>4</td>
<td>0</td>
<td>∞</td>
</tr>
<tr>
<td>Tracheal stenting</td>
<td>4</td>
<td>0</td>
<td>∞</td>
</tr>
</tbody>
</table>

*C = Number of units cross-matched
*T = Number of units transfused

\[
\frac{C}{T} = \frac{\text{No. of units cross matched}}{\text{No. of units transfused}} \quad \text{(standard: <3)}
\]

Transfusion probability (%) = \[
\frac{\text{No. of patients transfused}}{\text{No. of patients cross matched}} \times 100 \% \quad \text{(standard: >30%)}
\]

Transfusion index (TI) = \[
\frac{\text{No. of units transfused}}{\text{No. of patients cross matched}} \quad \text{(standard: >0.5)}
\]
Recommendations/Remedial measures

1. Identify problem or issue
2. Set criteria & standards
3. Observe practice / data collection
4. Compare performance with criteria & standards
5. Implementing change

Diagram:
- 1. Identify problem or issue
- 2. Set criteria & standards
- 3. Observe practice / data collection
- 4. Compare performance with criteria & standards
- 5. Implementing change
• Held a CME in ENT department (8th August 2014)
  – Findings presented
  – Preoperative blood ordering policy draft

• Presented at Anesthesia Department CME (12th August 2014)
  – Discussed and agreed upon the recommended guidelines

• Recommendations printed and laminated and kept in the ward for reference during pre-op rounds and pre-op blood ordering
<table>
<thead>
<tr>
<th>Procedure</th>
<th>Blood ordered (units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adenotonsillectomy</td>
<td>GSH</td>
</tr>
<tr>
<td>Radical neck dissection</td>
<td>GSH</td>
</tr>
<tr>
<td>Functional neck dissection</td>
<td>GSH</td>
</tr>
<tr>
<td>Flap reconstruction</td>
<td>GXM (2)</td>
</tr>
<tr>
<td>Parotidectomy</td>
<td>GSH</td>
</tr>
<tr>
<td>Glossectomy</td>
<td>GXM (2)</td>
</tr>
<tr>
<td>Total laryngectomy and thyroidectomy</td>
<td>GSH</td>
</tr>
<tr>
<td>Maxillectomy</td>
<td>GXM (2)</td>
</tr>
<tr>
<td>FESS</td>
<td>GSH</td>
</tr>
<tr>
<td>Endoscopic DCR</td>
<td>GSH</td>
</tr>
<tr>
<td>Submandibulectomy</td>
<td>GSH</td>
</tr>
<tr>
<td>Mastoidectomy</td>
<td>GSH</td>
</tr>
<tr>
<td>Sialendoscopy, Examination under microscopy ears, Foreign body removal, Myringotomy and grommet, Frenotomy, Excision lymph nodes/ branchial cyst/ sistrunk, Tracheostomy, Direct laryngoscope, oesophagoscope, septoplasty, tracheal stenting, bronchoscopy</td>
<td>Nil</td>
</tr>
<tr>
<td>Neck exploration</td>
<td>Nil/GSH</td>
</tr>
</tbody>
</table>

* GSH = Group Screen and Hold, GXM = Group cross matched
Result (Post Audit)
## Table 4: Elective operations post-audit that were cross matched and transfused

<table>
<thead>
<tr>
<th>Procedure</th>
<th>No. of Procedures</th>
<th>C</th>
<th>T</th>
<th>No. of patients cross-matched</th>
<th>No. of patients transfused</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partial glossectomy, unilateral radical neck dissection</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total laryngectomy &amp; thyroidectomy</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Wide excision of tongue mass</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Endoscopic maxillectomy</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4</strong></td>
<td><strong>8</strong></td>
<td><strong>2</strong></td>
<td><strong>4</strong></td>
<td><strong>1</strong></td>
</tr>
</tbody>
</table>

**N=21**

*C* = Number of units cross-matched

*T* = Number of units transfused

### Overall index

1) Overall  \[
\frac{C}{T} = \frac{8}{2} = 4
\] (standard: <3)

2) Overall  \[
T\% = 4 \times 100 = 25
\] (standard: >30%)

3) Overall  \[
TI = \frac{2}{4} = 0.5
\] (standard: >0.5)
Table 6: Overall index ratios pre and post-audit

<table>
<thead>
<tr>
<th></th>
<th>C/T ratio</th>
<th>T%</th>
<th>TI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target</td>
<td>&lt;3</td>
<td>&gt;30</td>
<td>&gt;0.5</td>
</tr>
<tr>
<td>Pre-audit</td>
<td>6</td>
<td>22.5</td>
<td>0.56</td>
</tr>
<tr>
<td>Post-audit</td>
<td>4</td>
<td>25</td>
<td>0.5</td>
</tr>
</tbody>
</table>
Figure 1: Reason for shortfall

- 66.66% Misunderstanding regarding exact procedures
- 33.33% Ignorance of medical officer
Methods to overcome shortfall

- Continuous emphasis by conducting frequent CMEs
- More copies of recommended guidelines in clinic/ ward
Limitations

• Post-audit numbers are small

• Time constraints
Conclusion

• This audit showed improvement in target index ratios
• A standard guideline is essential to avoid unnecessary blood wastage

• WHERE DO WE GO FROM HERE?
  – An established standard guideline
“Cross match to transfusion ratio and blood ordering related cost are both significantly reduced with the application of institutional cross-match protocol.”
C/T Ratio for Jan- June 2016 : 2.1
An Audit on Universal Newborn Hearing Screening (UNHS) of Hospital Bukit Mertajam: Completing Well-Baby Hearing Screening by 1 Month of Age
Universal Newborn Hearing Screening (UNHS) is aimed to detect hearing loss among well-babies and to provide early intervention for congenital hearing loss.

The practice screens the hearing of every baby born, with or without high risk factors for hearing loss.
Newborn hearing screening

1\textsuperscript{st} screening

- \textbf{Pass}
- \textbf{Refer}

2\textsuperscript{nd} screening

- \textbf{Pass}
- \textbf{Refer}

\textbf{Diagnosis}

- \textbf{Normal}
- \textbf{Abnormal}

\textbf{Intervention}

- \textbf{BY 3 MONTHS}
- \textbf{BY 6 MONTHS}

\textbf{PRIOR TO DISCHARGE / BY 1 MONTH}

(Adapted from the Malaysian Ministry of Health (MOH) 2015 & Joint Committee of Infant Hearing, JCIH 2007)
In-Ward Screening
Postnatal Ward of HBM

Weekdays In-ward 1st Screening
Covered during daily ward visit by the audiologists

Babies Born on Weekend / Public Holiday
No ward visit

Outpatient Screening
ENT Clinic of HBM

FOR 1st SCX
Directly referred as outpatient for 1st screening

FOR 2nd SCX
Referred as outpatient for 2nd Screening

Outpatient Hearing Screening
Most well-babies who were referred for outpatient hearing screening were turning up at ENT Clinic of after passing neonatal period / later than 1 month of age. Hence, completion of hearing screening was delayed.

As babies get older, screening may become difficult or time consuming. Chances for false positives may also increase as babies tend to develop earwax or catch flu.
Pre-audit

The guidelines set by the Malaysian Ministry of Health (MOH), as per adapted from the Joint Committee of Infant Hearing, JCIH 2007 recommends that ideally 95% newborns shall complete hearing screening by 1 MONTH of age. Anyway, HBM UNHS data analysis dated from Mar-Aug 2015 showed lack of compliance towards the proposed guideline.

<table>
<thead>
<tr>
<th>CRITERIA</th>
<th>MAR-MAY 2015 (%)</th>
<th>JUNE-AUG 2015 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well-babies who received outpatient 1\textsuperscript{st} screening by 1 month of age</td>
<td>17</td>
<td>14</td>
</tr>
<tr>
<td>Well-babies who received follow-up 2\textsuperscript{nd} hearing screening by 1 month of age</td>
<td>26</td>
<td>32</td>
</tr>
<tr>
<td>Well-babies who completed hearing screening by 1 month of age</td>
<td>69</td>
<td>77</td>
</tr>
</tbody>
</table>
Reasons for shortfall

– **Less structured newborn hearing screening appointment**

– **False positives**

Newborns with excessive earwax could fail OAE screening and would be rescheduled for another follow-up screening date. This will delay both completion of screening and diagnosis.

– **Patient factor**

  Parents have rescheduled the given appointment
1. **Recommended screening age**

JCIH recommends that 95% from the number of newborns shall ideally complete screening (inpatient & outpatient screen) by 1 month of age.

*Joint Committee of Infant Hearing (JCIH), 2007*

*Malaysian Ministry of Health (MOH) 2015*
2. The benefits of early identification and intervention for congenital hearing loss.

Children who are identified with hearing loss between birth to first six months of life and receives immediate intervention has significantly higher cognitive, language and social development (Appuzo, M & Yoshinaga-Itano, 1995).
3. Possible reasons for loss-to-follow-up

A local study by distributing questionnaires to 314 parents who failed to bring their newborns for follow-up screening found the following as the contributing factors for poor follow-up:

- Lack of communication between screening personnel and parents

- Lack of parents awareness regarding hearing loss among children and the need for early intervention.

- Transportation problem

(Mukari et.al 2006)
4. Ways to improve outpatient newborn hearing screening

AABR screener could be used as an alternative to OAE screener as it is less susceptible to false positives due to ear canal debris (Vohr et al., 2001)

2 steps-screening procedure which involves rescreening newborns who failed OAE screening with AABR screener, within the same day, is found to be highly effective in overcoming false positives and identifying hearing loss among newborns (Patel et al. 2011)

AABR = Automated Auditory Brainstem Response
OAE = Oto-acoustic Emission
## Aim & objectives

<table>
<thead>
<tr>
<th>Aim</th>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>To complete 95% well-baby hearing screening by 1 month of age</td>
<td>1. To initiate 95% outpatient 1st hearing screening among well-babies who missed in-ward hearing screening by 1 month of age.</td>
</tr>
<tr>
<td></td>
<td>2. To complete 95% outpatient 2nd screening by 1 month of age.</td>
</tr>
<tr>
<td></td>
<td>3. To reduce chances for false positives by implementing OAE-OAE-AABR protocol.</td>
</tr>
<tr>
<td></td>
<td>4. To provide alternative hearing screening centres for parents with difficulty to turn up for follow-up at Hospital Bukit Mertajam</td>
</tr>
</tbody>
</table>
95% newborns shall complete hearing screening by 1 month of age.

(Joint Committee of Infant Hearing, JCIH 2007, adapted into MOH Guidelines for Hearing Screening, 2015)
Methodology

• Remedial actions were implemented from Sept-Dec 2015.

• Data collection was done from Jan-Jun 2016 using data extraction from the monthly UNHS Ms.Excel datasheet.
### Remedial actions

<table>
<thead>
<tr>
<th>ACTIONS</th>
<th>BEFORE</th>
<th>AFTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restructuring of newborn hearing appointment system at ENT Clinic of Hospital Bukit Mertajam</td>
<td>24 appointments / week shared between well-babies from the Postnatal Ward of Hospital Bukit Mertajam and high-risk babies from NICU Hospital Seberang Jaya.</td>
<td>2 separated hearing screening slots, well-baby hearing screening slot and high-risk baby hearing screening slot. 8-16 appointments / week are allocated for well-baby hearing screening. (Mon, Tues &amp; Thurs) 12 appointments/ week are allocated for high-risk baby hearing screening. (Wed, Friday)</td>
</tr>
<tr>
<td>ACTIONS</td>
<td>BEFORE</td>
<td>AFTER</td>
</tr>
<tr>
<td>----------</td>
<td>--------</td>
<td>-------</td>
</tr>
<tr>
<td>Revised hearing screening protocol to reduce false positives.</td>
<td>OAE-OAE protocol was used.</td>
<td><strong>OAE-OAE-AABR</strong> protocol is applied.</td>
</tr>
<tr>
<td></td>
<td>Well-babies who had earwax / flu and failed 2nd OAE screening were often rescheduled to repeat on other day-extended screening.</td>
<td>Well-babies who had earwax / flu and failed 2nd OAE screening, are screened with AABR on the same day.</td>
</tr>
<tr>
<td>Upgraded hearing screening pamphlets.</td>
<td>No contact information of other participating MOH hospitals for newborn hearing screening.</td>
<td>Contact information of other MOH hospitals which offers newborn hearing screening is added, to ease continuation of hearing screening at other hospital, if need arise.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pamphlets are stapled together with referral slip</td>
</tr>
</tbody>
</table>
Revised well-baby hearing screening protocol

**OUTPATIENT 1ST SCX**

1. **OAE PASS**
2. **OAE REFER**

**OUTPATIENT 2ND SCX**

1. **OAE PASS**
2. **OAE REFER**

**DIAGNOSIS BERA**

---

**1st visit**

**OUTPATIENT 1ST SCX**

1. **OAE PASS**
2. **OAE REFER**

**AABR PASS**

**AABR REFER**

**DIAGNOSIS BERA**

---

**2nd visit**

**OUTPATIENT 1ST SCX**

1. **OAE PASS**
2. **OAE REFER**

**AABR PASS**

**AABR REFER**

**DIAGNOSIS BERA**

---

BERA = Brainstem Evoked Auditory Response
CIRI-CIRI BAYI YANG BERISIKO TINGGI

- Sejarah keluarga
- Demam kuning
- Kecacatan kraniofalsial
- Lahir tidak cukup bulan
- Kurang berat lahir (<1.5kg)
- Masalah meningitis (bacterial)
- Ototoksid (Kesan ubat tertentu)
- Infeksi congenital (toxoplasmosis, rubela, cytomegalovirus, herpis, sifilis)
- Berada lama dalam ventilasi mekanikal
- Mempunyai sindrom (Down sindrom, Waardenburg sindrom, Usher sindrom dan lain-lain)

TANDA-TANDA MEMPUNYAI MASALAH PENDENGARAN

1. Masalah percakapan (lewat berbicara, pelat)
2. Tiada respon apabila dipanggil nama dan sebagainya
3. Tiadak terkejut terhadap bunyi-bunyi kuat

Adakah anak anda mempunyai simptom/tanda-tanda di atas?? Jika YA, buatlah pemeriksaan pendengaran SEGERA!!!!!
FAKTOR-FAKTOR RISIKO MASALAH PENDENGARAN DI KALANGAN BAYI

- Faktor keturunan
- Demam kuning / jaundice melebihi 350 μmol
- Kecacatan pada kepala / mulut / telinga
- Berat lahir kurang daripada 1.5 Kg
- Meningitis / radang selaput otak
- Pengambilan ubat antibiotik di NICU
- Jangkitan kuman semasa hamil (Toxoplasmosis, Rubella, Cytomegalovirus, Herpes & Sifilis)
- Menerima bantuan pernafasan mekanikal
- Mempunyai sindrom
- Kecederaan atau trauma pada kepala

TANDA-TANDA MASALAH PENDENGARAN PADA KANAK-KANAK

- Tidak terkejut pada bunyi kuat
- Kurang respon pada bunyi / suara
- Kelewatan bertutur (> 36 bulan)
- Tidak memahami arahan ringkas secara bertutur dan tampa ditunjun
- Jarang bersuara tetapi aktif menggunakan tanda isyarat untuk menyiapkan kehendak
- Sikap suka menyendiri

Jika anak anda mempunyai faktor-faktor risiko / tanda-tanda masalah pendengaran, sila hubungi penolong lanjut!

UNTUK Pertanyaan Lanjut, Sila Hubungi UNIF AUDIOLOGI / JABATAN ENT HOSPITAL - HOSPITAL BERICUT:

1. HOSP. TUNJUK KIAH, KANGAR 04-973 8000 / 8221
2. HOSP. SULTANAH BAHYAH, ALOR SETAR 04-740 6231 / 7754
3. HOSP. SULTAN ABDUL RAHIM, SUNGAI PETANI 04-447 7313
4. HOSP. KULIM 04-422 5349 / 5323
5. HOSP. PULAU PINANG 04-222 5331 / 1077
6. HOSP. BUKIT MERTAJAM 04-479 7133 / 200
7. HOSP. TAPIING 05-820 4000
8. HOSP. RAJA PERMAISURI BAINUN, IPOH 05-263 1000
9. HOSP. TELUK INTAN 05-621 1331
10. HOSP. SINGAI BULOH 03-614 5333
11. HOSP. PUTRAJAYA 03-812 4200
12. HOSP. SERDANG 03-8947 4355
13. HOSP. SELAYANG 03-626 3331
14. HOSP. KUALA LUMPUR 03-261 5555
15. HOSP. AMPANG 03-429 6000
16. HOSP. TENGGU AMPANAH RAHMAH KLANG 01-375 7000
17. HOSP. MELAKA 06-282 2344
18. HOSP. TUNJUK JAAFAR, NEGERI SEMBILAN 06-703 6000
19. HOSP. TENGGU AMPANAH AFZAN KUANTAN 03-1172 1333
20. HOSP. KUALA LIPIS, PAHANG 09-312 5333
21. HOSP. SULTANAH NURZAHRIH, TENGANGANI 09-621 2121
22. HOSP. KEMAJUAN, TENGANGANI 09-851 1331 / 1189
23. HOSP. RAJA PEREMPUAN ZAINAB, KELANTAN 09-621 1111
24. HOSP. SULTANAH AMINAH, HOHR BAHRI 07-165 5000
25. HOSP. SULTANAH ISMAIL, HOHR BAHRI 07-222 7579
26. HOSP. BUKIT KEGALAMAT, BATU PAHAT 07-136 3000
27. HOSP. SEGAMAT 07-943 1331 / 100
28. HOSP. UMIM SARAWAK, KUCHING 08-272 6666
29. HOSP. MIRI, SARAWAK 08-342 9003
30. HOSP. QUEEN ELIZABETH, KOTA KINABALU 08-851 7555 / 7570
31. HOSP. LIKA'S, KOTA KINABALU 08-412 2600
32. HOSP. TAWAU, SABAH 08-918 1111

PROGRAM SARINGAN PENDENGARAN BAYI

UNIT AUDIOLOGI
JABATAN TELINGA, HIDUNG & TEKAK
HOSPITAL BUKIT MERTAJAM
JALAN KULIM, 44000 BUKIT MERTAJAM
PULAU PINANG
NO.TEL: 04-5497333/200/205
Outcome

After implementing the proposed changes to our clinical practice, we managed to boost up the percentage of well-babies who completed hearing screening by 1 month from average 73% in Mar-Aug 2015 to average 99% in Jan-June 2016. We are now meeting the benchmark recommended by JCIH 2007.

**AIM:** To complete 95% well-baby hearing screening by 1 month of age

<table>
<thead>
<tr>
<th>Period</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mar-May 2015</td>
<td>69%</td>
</tr>
<tr>
<td>June-Aug 2015</td>
<td>77%</td>
</tr>
<tr>
<td>Jan-March 2016</td>
<td>98%</td>
</tr>
<tr>
<td>Apr-June 2016</td>
<td>99%</td>
</tr>
</tbody>
</table>
This audit has helped us to improve the efficiency of well-baby hearing screening by completing 95% well-baby hearing screening by 1 month of age, on par with the principle of early detection and intervention for neonatal hearing loss, as per recommended by the Joint Committee of Infant Hearing (JCIH).
BENEFITS

- Ensures better compliance to recommended guideline.
- Reduces professional workload and more time efficient as babies are easier to be screened when they are younger.
- Reduces overall cost as earlier screening may save need for costly diagnostic test (BERA).
- Quickens diagnosis and intervention procedure.
- Reduces the number of follow-ups and benefits parents.

Benefits for parents include:
- Quicker diagnosis and intervention procedure.
- Easier screening at younger ages.
- Reduction in overall cost.
- Improved compliance with recommended guidelines.
- Fewer follow-ups.
References


Reduce The Incidence of Extravasation in Contrasted CT Scan Examinations at Diagnostic Imaging Department Penang Hospital
60% of total CT cases performed require contrast enhancement

Extravasation is an uncommon incident of intravenous injection of contrast media.

However, if occurs, complications can be catastrophic!
Complications

- Swelling
- Blistering
- Skin ulceration
- Gangrene (Dry/Wet) & Amputation
- Compartment syndrome
- Longer hospital stay & cost
Baby lost her left arm due to infusion extravasated causing compartment syndrome, gangrene and auto amputation.
Contrast Extravasation

- Occurs when
- Branulla dislodged
- Vein rupture

Contrast leakage into surrounding soft tissue causes swelling at injection site.

CONTRAST EXTRAVASATION

Ref: http://www.jprasurg.com/article/S1748-6815%2807%2900148-9/abstract
Objectives of audit

* To Reduce Incidence of Contrast Extravasation during CT Scan Examination

* To comply with National KPI Standard 2015
  (KPI Indicator 6 - Percentage of patients developed significant contrast media extravasation following CT examination with intravenous (IV) contrast media should not exceed 1%)

* To improve patient care.
  (2014 data showed an increase trend in extravasation cases).
Workflow - Contrast Enhanced CT Scan

- Form Received, Screened & Registered
- Set Branulla
- Connector to injector
- Scanning Performed & Specified Protocols.
- Images Reported by Radiologist
- Examination Completed. Patient discharge to respective clinics/wards
## Audit criteria and standard

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>All patients undergoing contrasted CT examinations during the study period.</td>
<td>The extravasations cases should be &lt;0.3%</td>
</tr>
</tbody>
</table>

**MMoH STD - KPI <1%**

**ACR STD: 0.1%-0.9% (1/1,000 patients to 1/106 patients)**

<table>
<thead>
<tr>
<th><strong>Methodology</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Study design</td>
</tr>
<tr>
<td>Subject</td>
</tr>
<tr>
<td>When</td>
</tr>
<tr>
<td>Where</td>
</tr>
<tr>
<td>How</td>
</tr>
<tr>
<td>Reliability</td>
</tr>
<tr>
<td>Pre-remedial</td>
</tr>
<tr>
<td>Remedial measure</td>
</tr>
<tr>
<td>Post-remedial</td>
</tr>
</tbody>
</table>
Measurement

Formula = \frac{\text{Numerator}}{\text{Denominator}} \times 100\%

- **Numerator**
  - Number of patients developed significant extravasation following CT examination with IV contrast.

- **Denominator**
  - Total number of patients underwent CT examination with IV contrast
Findings 1st Quarter 2015 (Pre Audit)
**Analyse Findings**

MMoH KPI achieved, **BUT** there is room for improvement.

<table>
<thead>
<tr>
<th>Month</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>0.19</td>
</tr>
<tr>
<td>Feb</td>
<td>0.23</td>
</tr>
<tr>
<td>March</td>
<td>0.58</td>
</tr>
</tbody>
</table>
Remedial Measures and Outcome
## Identify Shortfalls in Quality (SIQ)

<table>
<thead>
<tr>
<th>Factors</th>
<th>Cause</th>
<th>Identification of Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Staff</strong></td>
<td>Awareness</td>
<td>Knowledge on causes, signs/symptoms and severity of contrast extravasation among CT staff were still lacking. Inadequate during ‘test injection’. Inadequate, especially on the junior staff.</td>
</tr>
<tr>
<td></td>
<td>Monitoring</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Supervision</td>
<td></td>
</tr>
<tr>
<td><strong>Work &amp; Care Environment</strong></td>
<td>Branulla</td>
<td>- Higher rate of extravasation incidence seen among patients from ward with indwelling branulla.</td>
</tr>
<tr>
<td></td>
<td>Injector</td>
<td>- Dislodged branulla during contrast injection.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flow rate &amp; size of branulla, especially inpatients. (High pressure &amp; flow rate can induce rupture of vessel wall)</td>
</tr>
</tbody>
</table>
Roster for Senior Radiographers to monitor the workflow in CT room

<table>
<thead>
<tr>
<th>JADUAL TUGAS PENGAWASAN BAGI JURU X-RAY U32 &amp; U36 BILIK CT SCAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
Monitor patient in CT Room by Radiographers

Flow rate and pressure reduced

Monitoring after injection

Detail monitoring during ‘test inject’ by CT radiographers
<table>
<thead>
<tr>
<th>Factors</th>
<th>Cause</th>
<th>Identification of Problem</th>
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</thead>
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<tr>
<td>Staff</td>
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<tr>
<td></td>
<td>Monitoring</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Supervision</td>
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<td>Work &amp; Care Environment</td>
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<tr>
<td></td>
<td>Injector</td>
<td>- Dislodged branulla during contrast injection.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flow rate &amp; size of branulla, especially inpatients. (High pressure &amp; flow rate can induce rupture of vessel wall)</td>
</tr>
</tbody>
</table>
All inpatient are rechecked by CT Room Nurses

*(Indwelling branulla tested and cleared with 5-10cc of heparinised saline)*
Patient’s hand secured by a temporary splint – to ensure no extravasation
Extravasation rate from January to March was in increasing trend (0.19%-0.58%). However, was below National KPI level.

Prompt intervention from April revealed significant improvement (0%)
<table>
<thead>
<tr>
<th>Month</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>0.19</td>
</tr>
<tr>
<td>Feb</td>
<td>0.23</td>
</tr>
<tr>
<td>March</td>
<td>0.58</td>
</tr>
<tr>
<td>April</td>
<td>0</td>
</tr>
<tr>
<td>May</td>
<td>0</td>
</tr>
<tr>
<td>June</td>
<td>0</td>
</tr>
<tr>
<td>Average</td>
<td>0.16</td>
</tr>
</tbody>
</table>
Identifying shortfalls in quality, prompt remedial and good clinical practice have proved to significantly reduce contrast extravasation and National KPI was realistic and achievable.
# Checklist for Contrast Examinations

<table>
<thead>
<tr>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Patient</strong></td>
</tr>
<tr>
<td>Diabetic</td>
</tr>
<tr>
<td>IVDU/Biohazard</td>
</tr>
<tr>
<td>Vascular disease</td>
</tr>
<tr>
<td>Oedematous/obese</td>
</tr>
<tr>
<td>Renal failure/Nephropaty</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2. Type of examination</strong></td>
</tr>
<tr>
<td>a. Multiphase CT examination</td>
</tr>
<tr>
<td>b. CTA all body part</td>
</tr>
<tr>
<td>c. Other CT examinations</td>
</tr>
<tr>
<td>d. Peads CT Examination</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>3. All inpatient must be accompanied by either S/N in charge /HO/MO [especially very ill patients]</strong></td>
</tr>
</tbody>
</table>
References


2. Extravasation of radiographic contrast material and compartment syndrome in the hand: a case report
   http://www.researchgate.net/publication/49811226_Extravasation_of_radiographic_contrast_material_and_compartment_syndrome_in_the_hand_a_case_report


4. Left Arm Compartment Syndrome Due to Extravasation of Contrast Medium
   http://www.anatomicaljustice.com/Custom-Medical-Illustrations/Left-Arm-Compartment-Syndrome-Due-to-Extravasation-of-Contrast-Medium?service=13&MS=0&BR=0&ST=1&page=13&id=1506


Sustainable clinical audit initiatives

01. Format:
   Audit Cycle, Marking Scheme,
   Proposal, Abstract

02. Dissemination:
   Publication, Conference
   (Local & International)

03. Leadership:
   Culture, Behavioral Innovation,
   Social Conformity
### A. ELEMENT FOR TECHNICAL CONTENTS (90 marks)

<table>
<thead>
<tr>
<th>No.</th>
<th>Element to be judged</th>
<th>Guide to marks allocation</th>
<th>Maximum marks</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Selection of Study</td>
<td>Brief description of context</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>What is the quality of care selected</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Findings of literature search</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>What is the audit criteria and the standard?</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>Data collection</td>
<td>Method</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Are the data collected appropriate / reliable?</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>Analysis and interpretation of results</td>
<td>What were the results?</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Analysis of the results</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reasons for shortfall in quality (SIQ)</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>4</td>
<td>Strategy for change</td>
<td>What changes are needed to achieve better patient care?</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>How would the changes be implemented?</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>5</td>
<td>Reaudit</td>
<td>Outcome of implementation of change</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

**Total marks for PART A**

90
### B. PRESENTATION TECHNIQUE (10 marks)

<table>
<thead>
<tr>
<th>No.</th>
<th>Element to be judged</th>
<th>Guide to marks allocation</th>
<th>Maximum marks</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Slides</td>
<td>Easily understood, appropriateness of graphics, color scheme and font size etc</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>Oral Presentation</td>
<td>Smooth and logical flow of presentation, clarity of voice, content easily understood, keeping to time, confident and demonstrate ability of knowing subject matter well</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

**Total marks for PART B** 10
Clinical audit proposal format

Investigators/ Auditors
Department/ Unit
Hospital/ District/ Facility
Category: Clinical/ Clinical Support
Title
Title Abbreviation
Background
Objective(s)
Audit Description
  Benefit of the clinical audit
  Criteria & Standard
Inclusion & exclusion criteria
Definition(s)
Plan for data collection
(Methodology/ Sample Population/Sample Size/ Sampling Duration)

*What* data do you need to collect?
*Where* is the data?
*Who* will collect it (*Site auditors*)?
*How* will it be collected (*Data collection sheet*)?

What is the *Sampling Population*?
How much should you collect (*Sample size*)?
How long will it take to obtain the data (*sampling duration*)?
What *specific resources* do you need?
Action planning

What support will you need

Confidentiality and ethics

Publication Policy

Timetable for clinical audit (Gantt chart)
CLINICAL AUDIT: ABSTRACT FORMAT

1) NMRR ID:
2) TOPIC / TITLE:
3) AUTHORS:
4) CATEGORY:
5) INTRODUCTION
   - Overview of the problem selected / problem statement
   - Objectives of the clinical audit
   - Audit criteria and standard
     - **Criteria:** General statement about delivery of patient care
     - **Standard:** The proportion of time you feel that the criteria can be fulfilled to ensure quality of care

**e.g.:**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children under 2 years should be immunized</td>
<td>90% of 2 years of children are immunized</td>
</tr>
<tr>
<td>against polio</td>
<td>against polio</td>
</tr>
</tbody>
</table>
6) METHODOLOGY
   ▶ Study design, methods, and apparatus used

7) FINDINGS
   ▶ Actual results presented in forms of text, tables, and / or illustrations

8) EVALUATION
   ▶ Analyze findings
   ▶ Identify shortfall in quality (SIQ)

9) REMEDIAL MEASURES
   ▶ Suggestions to improve quality of care based on the causes of shortfall discovered in clinical audit

10) REAUDIT FINDING
    ▶ Outcome of implementation of change

NOTE: NOT EXCEEDING 250 WORDS

Prepared by: Medical Quality Unit Penang State Health Department
Version 1.0; Version date: 28 June 2016
Latest News / Updates

1. **Conflict of Interest Declaration Form for Investigators** - 20/07/2016
   Please note that a new form, the Conflict of Interest Declaration Form for Investigators, will now be required to be submitted to MREC at the time of new study submissions (for initial approval) and post-approval amendments involving addition of new investigator/s only. Users are encouraged to start using this form immediately as this form will be made compulsory in NMRR effective 1 August 2016.


3. **New SAE Reporting Platform**
   Please be informed that all SAEs/ SUSARs reported to MREC from 15th June 2016 onwards are to be uploaded using the new SAE platform on NMRR. Documents on initial and follow up reports of SAE no longer need to be uploaded using the AOR function in NMRR. Those follow up reports from the initial reports which were sent via AOR function in NMRR are also to be uploaded using the new SAE platform where initial reports are required to be submitted along for reference.
   The AOR function for SAE report submission in NMRR will cease to function starting from 1st July 2016 onwards. So, you are very much encouraged to use the new SAE platform for SAE reporting from

MREC MEETING DATES 2016 (Updated on 25 February 2016)
Please click here for 2016 MREC Meeting Dates.

**MREC MEETING NOTIFICATION**
Session 14 MREC MEETING
Date: 09 August 2016 (Tuesday)

**JPP NIH MEETING DATES 2016**
Please click here for 2016 JPP NIH Meeting Dates.

**JPP NIH MEETING NOTIFICATION**
Session 8 JPP NIH MEETING
Date: 16 August 2016 (Tuesday)
The Online Journal of Clinical Audits

Welcome.

The Online Journal of Clinical Audits is an accessible database and reference area to publish and share audit reports. To date there has been no platform for sharing experiences. The founding members of this website, who are doctors working within the UK NHS, have come together to provide this resource.

All content is provided free of charge.
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All content is provided free of charge

- No registration or submission fee
- Not found in Beall’s list of predatory journals
National Conference for Clinical Research

NIH Scientific Meetings

Many other field-related conferences
Organizational Culture
“The culture of any organization is shaped by the worst behavior the leader is willing to tolerate”

Gruenter & Whitaker
Behavioral Innovation
Adapt to Adopt
Acknowledgement

• Medical Development Division, Ministry of Health, Malaysia
• Dr. Yeoh Xing Yi, Medical Officer, Department of Otorhinolaryngology, Hosp. P.Pinang
• Dr. Ng Sze Yin, Medical Officer, Department of Otorhinolaryngology, Hosp. P.Pinang
• Dr. Irise Chen Hoi Khin, Medical Officer, Department of Otorhinolaryngology, Hosp. P.Pinang
• Dr. Christopher Yeoh Siu Ngee, Medical Officer, Department of Otorhinolaryngology, Hosp. P.Pinang
- Dato' Dr. Hjh. Salwah bt. Hj. Hashim, Head of Department, Radiology Department, Hosp. P. Pinang
- Dr. Murrali A/L Silvarajoo, Medical Officer, Radiology Department, Hosp. P. Pinang
- G.D.P. Mahalatchimi Dave, Radiographer, Hosp. P. Pinang
- Anita Bibyana A/P Krishnan, Radiographer, Hosp. P. Pinang
- Fadzuatul Edah Bt Norsedin, Radiographer, Hosp. P. Pinang
• Revathy Sevasankaran, Clinical Audiologist, Hosp. Bukit Mertajam
• Nurhidayah Mat Noor, Clinical Audiologist, Hosp. Bukit Mertajam
• Yusni Zahriah Yusof, Clinical Audiologist, Hosp. Bukit Mertajam
• Dr. Tan Li Jian, Medical Officer, Otorhinolaringology Department, Hosp. Bukit Mertajam
• National Clinical Research Centre, Hosp. Kuala Lumpur
THANK YOU